

FOREST PEST MANAGEMENT

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THE 1985 WESTERN SPRUCE BUDWORM CONDITIONS IN SOUTHERN IDAHO AND PREDICTIONS FOR 1986

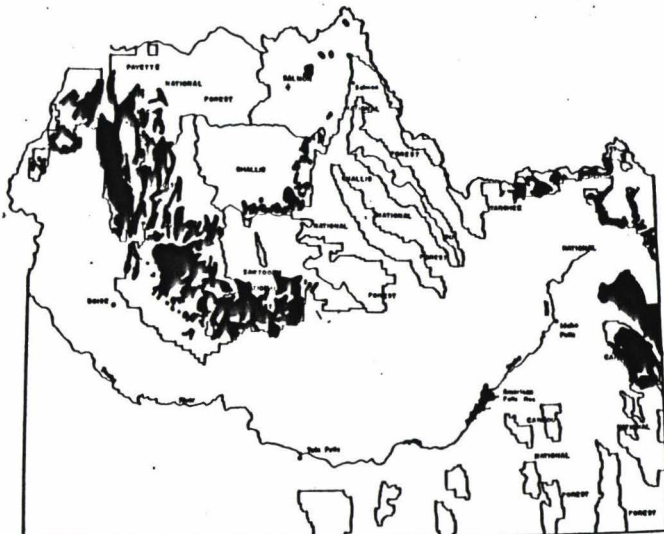
by

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ABSTRACT

Based on aerial detection surveys, susceptible conifers--primarily true firs and Douglas-fir--on approximately 2.6 million acres of forest land in southern Idaho were visibly defoliated by western spruce budworm (WSBW) during 1985. Extent of visible defoliation increased on all forests surveyed except the Targhee National Forest, where defoliation remained near 1984 levels. Likewise, defoliation intensity increased, with defoliation classified as heavy, increasing threefold from 1984 levels.

To verify defoliation occurrence and to forecast WSBW activity in 1986, populations were evaluated at 334 sample points. Based on these evaluations, defoliation intensity in areas of previously heavy activity should continue to be heavy or decrease slightly, while defoliation intensity in areas of relatively new activity should increase. Specific location of 1985 WSBW activity and that forecast for 1986 are discussed.



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Figure 1. Areas of WSBW Defoliation in Southern Idaho in 1985

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INTRODUCTION

Acreage of conifers visibly defoliated by western spruce budworm (WSBW), Choristoneura occidentalis Freeman, since 1952 in southern Idaho forests is shown in Table 1. Defoliation has resulted in incremental growth loss, varying degrees of top-kill, and occasional understory mortality (Beveridge and Cahill 1984). Land managers are very concerned about damage caused by this insect--where it occurred in 1985 and where it will occur next year. Thus, aerial detection surveys of National Forest and adjacent state lands in southern Idaho were conducted in 1985 by Forest Pest Management with cooperation from the Idaho Department of Lands to identify intensity and extent of current infestations. Population sampling was conducted to verify observations and to forecast WSBW activity in 1986.

METHODS

Aerial detection surveys to detect WSBW and other forest pest activity were conducted region-wide on a drainage-by-drainage basis from low-flying fixed-wing aircraft during July and August. Most forested lands in southern Idaho, except lands within the River of No Return Wilderness, Seven Devils Wilderness, and Sawtooth Wilderness were surveyed. Additionally, some areas in and adjacent to 1985 forest fire activity on the Salmon and Payette National Forests were not surveyed. Location and intensity of defoliation were mapped as described by Beveridge and Knapp (1984).

A previously used WSBW pupae case (exuviae) sampling system (Cahill and Knapp 1985) was modified to evaluate potential for defoliation of susceptible hosts. While this system is perhaps somewhat less reliable than other survey systems, it is considerably less expensive than the more commonly used egg mass surveys. Based on previous use and current modifications, reliability of the pupae case sampling system seems to be adequate for purposes of verifying WSBW occurrence and of forecasting general defoliation patterns for the following year.

Pupae case sampling was conducted on five National Forests in southern Idaho during late August and early September 1985 (Table 2). Sample point selection was based on accessibility, presence of host type, and aerially observed defoliation. At each point pupae cases on one 45-cm long lower crown branch from each of 12 randomly selected host trees were counted. Pupae case counts for each sample point were summed and these values used to forecast 1986 WSBW activity as follows:

Pupae Case Count	Percent Defoliation Predicted	Defoliation Classification Predicted
0-4	0-50%	light - moderate
5+	50%+	heavy

Also at each point defoliation was evaluated by visually estimating the amount of defoliation present in the crowns of sample trees. Defoliation was classified as follows: <25% defoliation = light; 25%-50% = moderate; and >50% = heavy.

Table 1. Acres of Defoliation by Western Spruce Budworm in Southern Idaho from 1952 through 1985.

Year	Acres in Southern Idaho	Acres Treated	Pesticide Used	Source of Information	
1952	1,000,000			Johnson & Denton	1975
1953	500,000			" "	"
1954	1,000,000			" "	"
1955	1,175,000	837,210	DDT	" "	"
1956	1,127,540	475,890	DDT	" "	"
1957	1,172,940	660,630	DDT	" "	"
1958	974,710			" "	"
1959	499,000			" "	"
1960	516,500			" "	"
1961	1,425,000			" "	"
1962	1,641,000			" "	"
1963	1,632,100	190,000	DDT	" "	"
1964	2,276,000	525,070	DDT	" "	"
1965	1,495,100			" "	"
1966	958,400			" "	"
1967	163,900			" "	"
1968	395,300			" "	"
1969	463,200			" "	"
1970	239,200			" "	"
1971	343,300			" "	"
1972	500,300			USDA Forest Service	1972
1973	224,100			" "	1973
1974	338,500			" "	1974
1975	614,200			" "	1975
1976*	555,200			" "	1976
1977*	644,200			" "	1977
1978*	915,800			" "	1978
1979*	1,113,200	139,000	Carbaryl & Acephate	" "	1979
1980*	1,248,400			" "	1980
1981*	1,228,200			" "	1981
1982*	2,258,000			" "	1982
1983*	2,375,500			" "	1983
1984*	2,032,700			" "	1984
1985*	2,600,000			" "	1985

*Does not include defoliation in the wilderness and primitive areas of southern Idaho.

Table 2. Defoliation by WSBW Predicted for 1986 Based on Pupae Case Counts

Area	Total Points Sampled	Predicted Defoliation Intensity	
		Light/Moderate (0-50%)	Heavy (+ 50%)
<u>Boise and Payette National Forests (1)</u>			
Little Salmon River	36	20	16
Mores & Grimes Creeks	22	5	17
Weiser River	53	29	24
North Fork Payette River	70	56	14
South Fork Payette River	19	7	12
Deadwood River	21	20	1
North & Middle Fork Boise River	29	2	27
Total	250	139	111
<u>Sawtooth National Forest</u>			
South Fork of Boise River	18	15	3
<u>Salmon National Forest</u>			
Salmon, North Fork & Cobalt Ranger Districts	19	13	6
<u>Targhee National Forest</u>			
Dubois Ranger District	20	16	4
Island Park, Ashton, Palisades, Teton Basin Ranger Districts	27	21	6
Total--Southern Idaho	334	204	130

(1) The Boise and Payette National Forests are grouped together because of the many common drainages

RESULTS AND DISCUSSION

Based on aerial detection surveys, conifers on approximately 2.6 million acres in southern Idaho were defoliated to some degree by WSBW during 1985. Compared to defoliation in 1984, this is an increase of nearly 570,000 acres and the most defoliation observed in any of the previous 33 years. Defoliation classified as light decreased threefold to 324,000 acres, while defoliation classified as heavy increased threefold to 1,423,000 acres. Moderate defoliation remained generally static at 837,000 acres. Acreage of each defoliation intensity--light, moderate, or heavy--for each National Forest surveyed is shown in Figures 2-8.

Actual individual tree defoliation observed in 1985 at population sampling points was generally higher than that predicted from 1984 pupae counts (Cahill and Knapp, 1985). Possibly the number of pupae cases required to predict moderate-to-high defoliation levels had been set too high. Therefore, with help from the Forest Pest Management Methods Application Group, the 1984 pupae case count data were statistically correlated with 1985 defoliation ratings from each corresponding sample point to improve defoliation predictions. The recalibrated pupae case class limits are those shown in the methods section.

Pupae case counts were made at 255, 20, 19, and 47 points on the Boise/Payette, Sawtooth, Salmon and Targhee National Forests, respectively (Table 2). Forecasts, using the modified classification scheme, for 1986 WSBW activity for sampled areas are shown in Table 2.

Following is a brief Forest by Forest summary of aerially observed conifer defoliation by WSBW during 1985, and based on pupae case surveys, general defoliation forecasts for 1986 in southern Idaho Forests.

BOISE

Extent and intensity of defoliation by WSBW increased throughout the susceptible host type on the Boise National Forest. Hosts on approximately 982,000 acres of conifers were visibly defoliated in 1985 compared to 786,000 acres in 1984. Light defoliation decreased from 291,000 acres to 101,000 acres, whereas moderate defoliation increased from 308,000 acres to 403,000 acres, and heavy defoliation increased from 187,000 acres to 476,000 acres (Figure 2). Increases in acreage of defoliation were attributed primarily to expansions of existing infestations into previously undefoliated areas of Douglas-fir throughout the southern portion of the forest. Presently, most host type is infested and shows some degree of visible defoliation.

Hosts in the West Mountains, North Fork Range, South Fork of the Payette River drainage, and the Mores Creek Summit-Beaver Creek Summit areas sustained the most severe damage on the Forest. Areas of moderate defoliation were scattered throughout host type, while most light defoliation was located on the southern portion of the Forest on the Idaho City, Boise, and Mountain Home RDs.

Population evaluations and field observations forecast substantial increases in defoliation intensity throughout the Grimes Creek and Mores Creek areas, moderate increases throughout the South Fork of the Payette River drainage, and static to decreasing levels of defoliation intensity throughout the Deadwood River drainage. Since most susceptible host type is currently infested, large increases in defoliated acreage are not expected to occur on the forest next year.

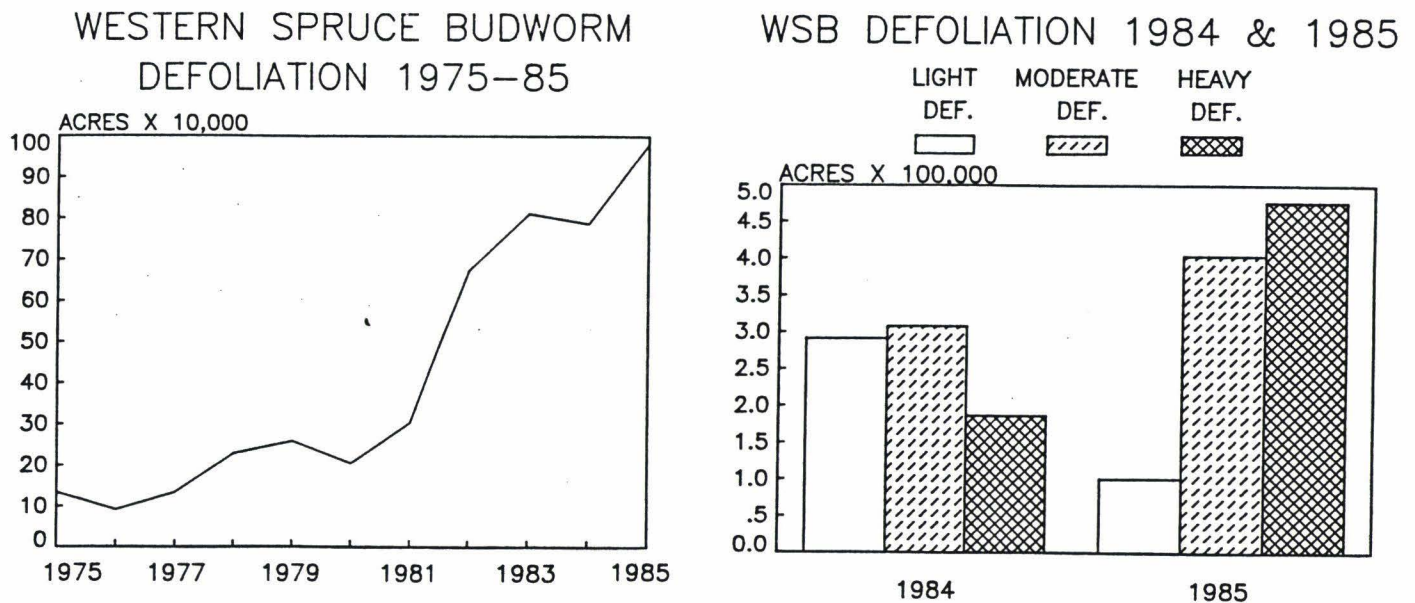


Figure 2. Western Spruce Budworm activity on the Boise National Forest

CARIBOU

Douglas-fir and subalpine fir continued to be defoliated throughout all areas surveyed. Acreage of defoliation increased from 145,000 acres in 1984 to 185,000 acres in 1985. Defoliation intensity increased forest-wide with all defoliation mapped being categorized as moderate or heavy (Figure 3). Top-killing and understory mortality are apparent in areas such as Caribou Basin where hosts have sustained several consecutive years of heavy defoliation.

Field observations indicate that WSBW infests substantial portions of the Forest not normally surveyed (only the area north of Tincup Creek is annually surveyed). Therefore actual acreages of defoliation may be substantially higher than is reflected in our figures.

Population sampling was not conducted during 1985; however, field observations in the Caribou Basin area suggest that WSBW activity will continue throughout areas of susceptible host type.

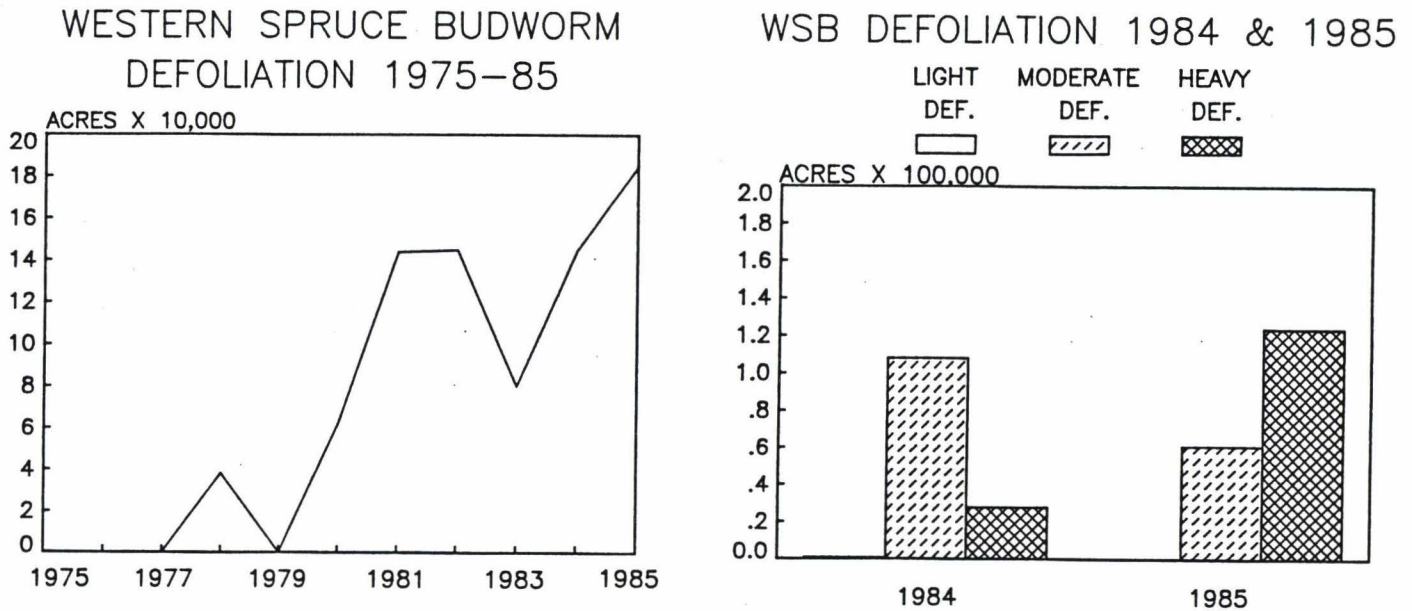


Figure 3. Western Spruce Budworm activity on the Caribou National Forest

CHALLIS

Douglas-fir and subalpine fir on approximately 100,000 acres were defoliated this year compared to only 615 acres in 1984, continuing a trend of large annual fluctuations in observed acreage of defoliation (Figure 4). Most defoliation observed this year was of light or moderate intensity and was widely scattered throughout the Salmon River drainage. Heavy defoliation, totaling almost 14,000 acres, was located from Muley Creek upstream along the Salmon River to Badger Creek and east of Squaw Creek. Acreage may be substantially higher than reported since only the Salmon River drainage from Lower Stanley north to the Forest boundary is annually surveyed.

Population sampling was not conducted on the Forest during 1985.

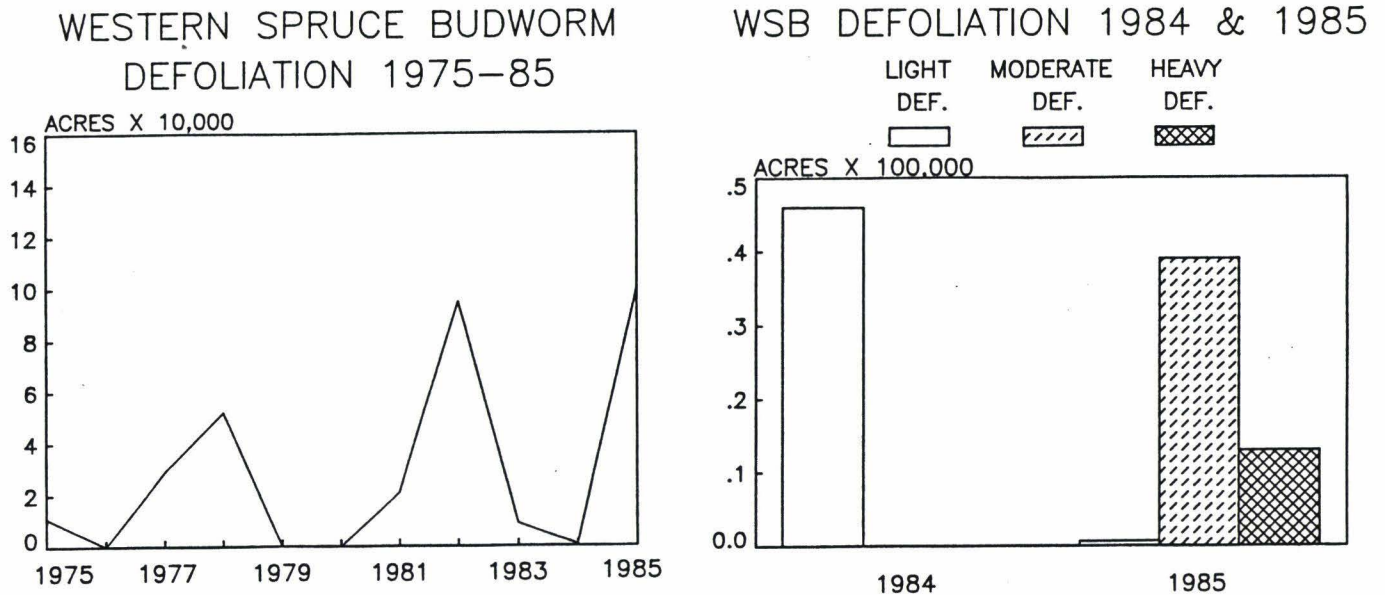


Figure 4. Western Spruce Budworm activity on the Challis National Forest

PAYETTE

Conifers on approximately 527,000 acres were visibly defoliated during 1985 compared to 463,000 acres in 1984. Increases in defoliated acreage occurred Forest-wide, but were particularly evident in the Douglas-fir type throughout the Cuddy and Hitt Mountains. Predictions based on population sampling conducted during 1984 indicated that a reduction in defoliated acreage and intensity should occur throughout some areas of infestation. However, in 1985 hosts in most of these areas continued to be moderately or heavily defoliated (Figure 5).

Heaviest defoliation continued to occur in the grand fir type throughout the West Mountains and along portions of the North Fork of the Payette River north of McCall. Elsewhere on the Forest, heavy defoliation was observed along the Middle and West Forks of the Weiser River drainage on the Council and New Meadows RD's, respectively, and throughout the Cuddy and Hitt Mountains on the Council and Weiser RD's, respectively. Areas of light and moderate defoliation were widely scattered throughout the forest.

Although population sampling indicates that total acreage of defoliation should remain near 1985 levels, some change in defoliation intensity is forecast. Moderate increases in defoliation intensity are predicted throughout the Little Salmon River drainage; static to slightly increasing levels of defoliation intensity are predicted for the Weiser River drainage; while static to decreasing levels of defoliation intensity are predicted for the North Fork of the Payette River drainage.

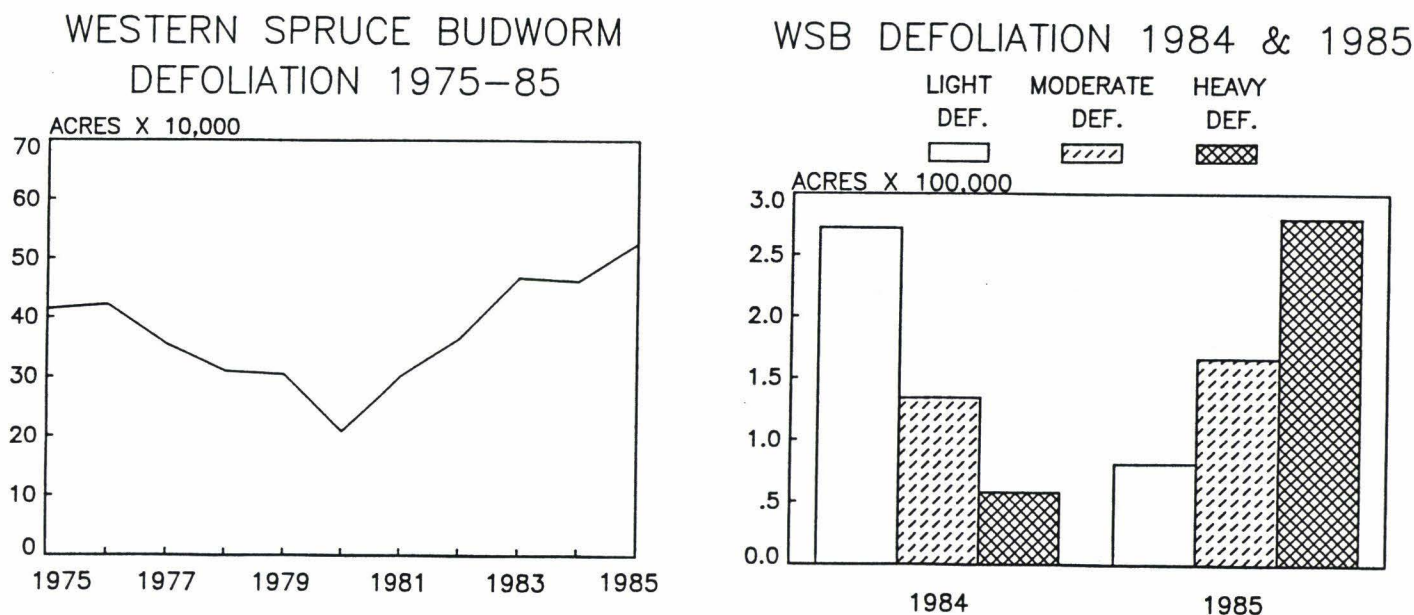


Figure 5. Western Spruce Budworm activity on the Payette National Forest

SALMON

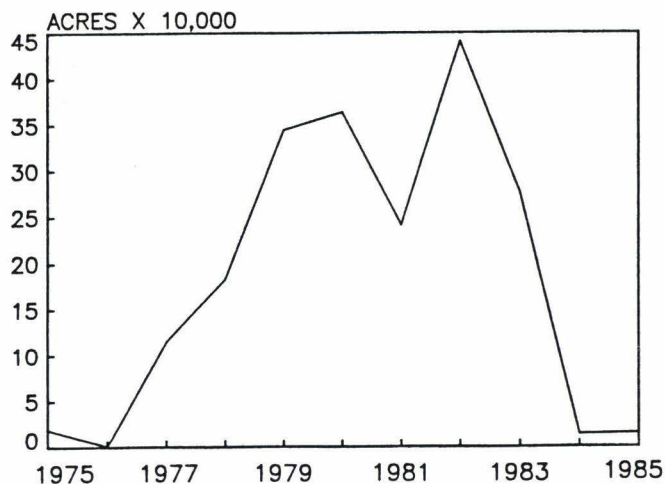
Infestation levels remained static throughout surveyed portions of the forest. Of those areas surveyed, hosts on only 15,000 acres were lightly defoliated (Figure 6). Heavy and moderate defoliation was observed.

Defoliation was mapped along Beaver Creek and Trail Creek on the Cobalt RD and along Boulder Creek and Dump Creek on the North Fork RD. Elsewhere on the forest, defoliation was mapped along Badger Creek and the headwaters of Hat Creek on the Salmon RD.

Field observations indicate that defoliation is present along portions of the Beaverhead and Lemhi Mountains. However, these areas are surveyed on a biennial basis and were not surveyed in 1985. In addition, portions of the North Fork of the Salmon River drainage were not surveyed due to poor visibility caused by the heavy fire activity during August which coincided with our scheduled aerial survey of the area.

Population sampling indicates that while acreage of defoliation should remain near current levels, increasing defoliation intensity may occur on currently infested portions of the Salmon, North Fork, and Cobalt RD's.

WESTERN SPRUCE BUDWORM DEFOLIATION 1975-85



WSB DEFOLIATION 1984 & 1985

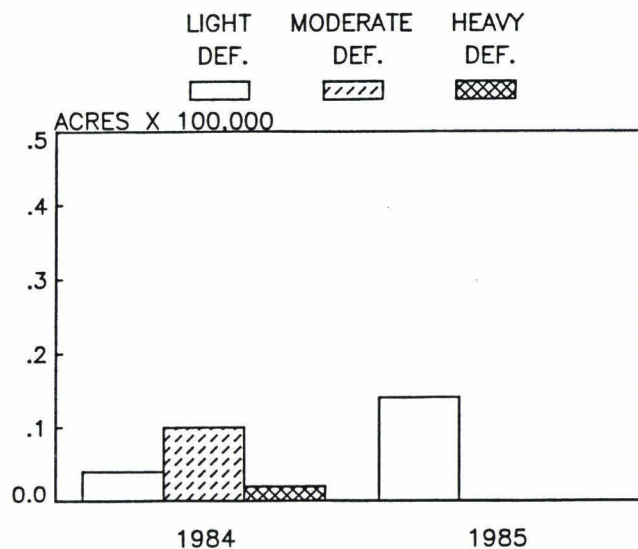


Figure 6. Western Spruce Budworm activity on the Salmon National Forest

SAWTOOTH

Hosts on approximately 335,000 acres were defoliated during 1985 compared to 144,000 acres in 1984. This expansion occurred on a Forest-wide basis and was not confined to any one area on the Forest. Defoliation intensity also increased. Heavy defoliation increased from 10,600 acres in 1984 to over 186,000 acres in 1985; moderate defoliation increased from 31,000 acres in 1984 to almost 123,000 acres in 1985; light defoliation decreased from 102,000 acres in 1984 to 25,000 acres in 1985 (Figure 7).

Large increases in defoliation acreage and intensity occurred throughout the Big Wood River area on the Ketchum RD. Isolated stands of Douglas-fir on the north side of the river, near Ketchum, appeared very heavily affected, while light to moderate defoliation was recorded on Bald Mountain Ski Area. On the Fairfield RD, moderate to heavy defoliation was recorded in Douglas-fir and subalpine fir throughout the South Fork of the Boise River drainage. One new isolated area of defoliation was observed near Pole Creek in Sawtooth Valley on the SNRA. On the Burley RD defoliation intensity continued to increase to mostly moderate to heavy levels in the Black Pine and Raft River areas.

Population evaluations suggest that extent and intensity of defoliation should remain near current levels throughout the South Fork of the Boise River drainage on the Fairfield RD. Populations in infested areas on the Ketchum and Burley RD's were not sampled in 1985; however, field observations suggest that continued defoliation will continue at or near present levels next year.

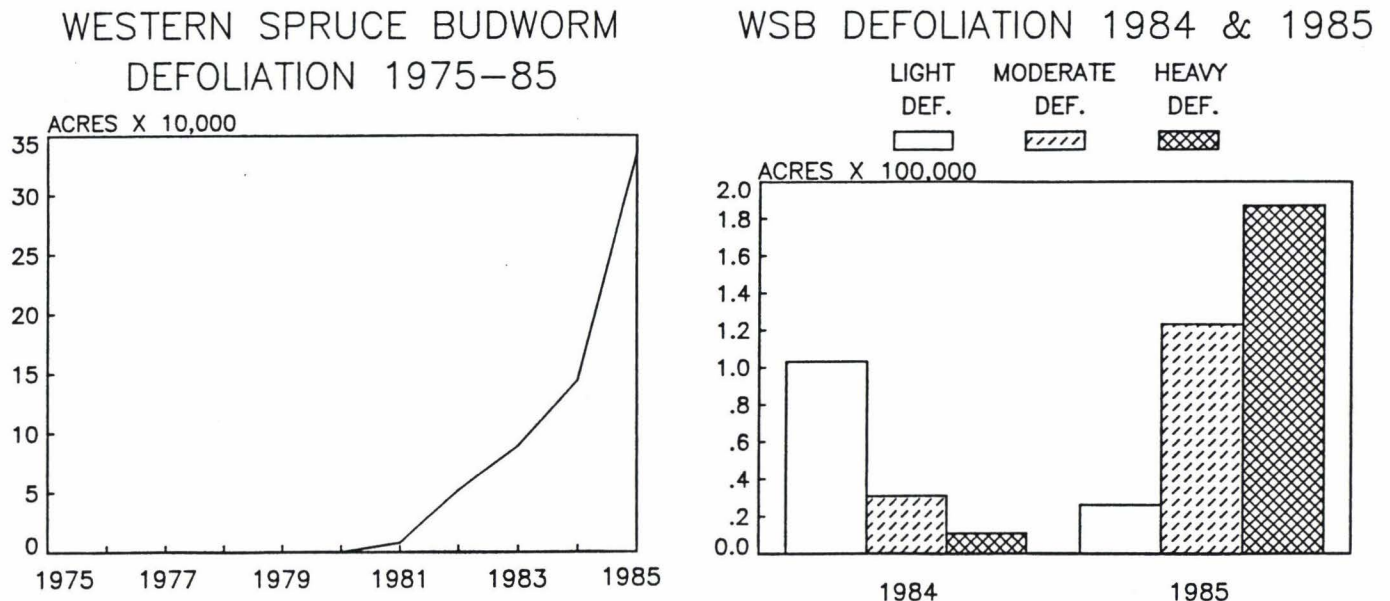


Figure 7. Western Spruce Budworm activity on the Sawtooth National Forest

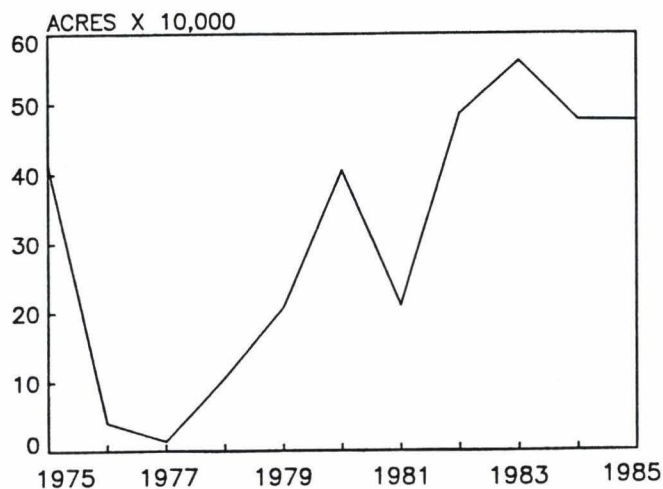
TARGHEE

Acreage of WSBW activity remained near 1984 levels with approximately 477,000 acres of defoliation mapped this year compared to 475,000 acres in 1984 (Figure 8).

Intensity of defoliation increased Forest-wide except in the Centennial Mountains on the Dubois RD, where defoliation intensity decreased substantially, possibly due to climatic factors. Heavy defoliation occurred throughout Douglas-fir and subalpine fir on Big Bend Ridge and from Eccles Butte south to Moose Creek Butte on the Ashton and Island Park RD's. Heavy defoliation was also noted along the Teton and Big Hole Mountains on the Teton Basin RD and throughout the Palisades Reservoir area on the Palisades RD.

Population sampling and field evaluations indicate that significant reductions in extent and intensity of WSBW defoliation should continue throughout the Centennial Mountains on the Dubois RD. Elsewhere on the Forest, little or no reduction in defoliation extent or intensity is forecast for 1986.

WESTERN SPRUCE BUDWORM DEFOLIATION 1975-85



WSB DEFOLIATION 1984 & 1985

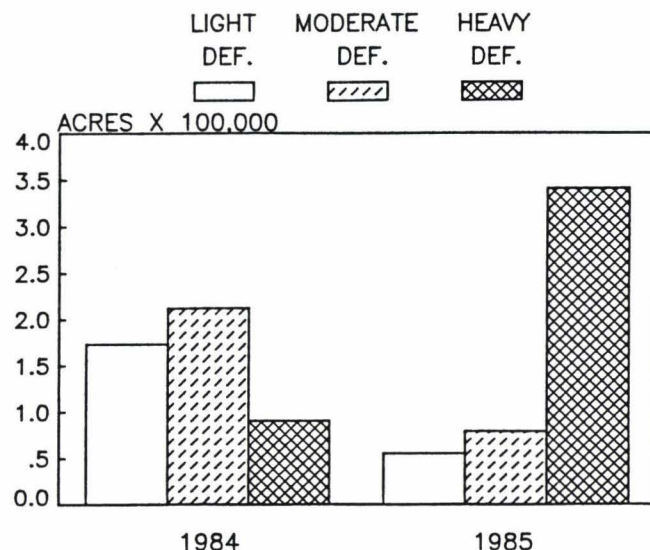


Figure 8. Western Spruce Budworm activity on the Targhee National Forest

MANAGEMENT ALTERNATIVES

Maintain Present Management: The infestation would be allowed to continue, likely for 7 to 10 years, until natural abatement occurs. Short-term resource impacts including growth loss, top-kill, some understory mortality, and reduced seed production would be accepted.

Direct Suppression: One or more available registered insecticides--carbaryl, acephate, malathion, or Bacillus thuringiensis Berliner, a microbial insecticide, would be applied either to the entire infestation or to a portion thereof. Approximate costs would be \$10 to \$15 per acre. Short-term impacts to the various resources would be reduced significantly for a 3- to 4-year period, after which the population would likely return to presuppression levels.

Because treatment would preserve the food base, a chronic infestation could develop, particularly if suppression is undertaken whenever the population resurges to damaging levels.

Silvicultural Management: Stands susceptible to WSBW activity would be managed to reduce potential for damage. Management treatments include:

- (1) Favoring a diversity of site-suited seral host and nonhost species.
- (2) Maintaining or improving stand vigor by conducting timely thinnings and selecting against trees affected with other damage agents including dwarf mistletoe and root/stem decays.
- (3) Harvesting susceptible stands at maturity using even-age regeneration systems.

RECOMMENDATIONS

To deal with WSBW infestations, an integrated approach is recommended with silvicultural management being the base program. Stands with highest resource value and potential for impact should be treated first.

Direct suppression may be considered in high-value young stands and in recreational or seed production areas where short-term protection is desirable and economically feasible.

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